ATOMIC ENERGY Newsletter

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Dear Sir:

Site for the erection of nuclear reactors to produce tritium (hydrogen-3) for the U.S. fusion bomb project has now been chosen by the USAEC. It is in Aiken and Barnwell counties, South Carolina, about 15 air miles south of Aiken, S. C., and about 20 air miles southeast of Augusta, Ga. Approximately 250,000 acres in area, its southwest boundary will be 18 miles of Savannah River waterfrontage; accordingly, it will be called the Savannah River Plant. Selection of this site, made by the USAEC, other government agencies, and E. I. du Pont de Nemours & Co. (prime contractor here), was passed on by the engineering firms of Stone & Webster; J. G. White Engineering; Ford, Bacon & Davis; The Austin Co.; and Sverdrup & Parcel who endorsed du Pont's findings. Criteria applied to site selection were: (1) Operating requirements of the nuclear reactors, i.e., large amounts of water and discharge basin for effluents (hence, importance of river proximity), electrical power (TVA's relative nearness gives immense source of available and expanding capacity), and proper ground water table and drainage, to prevent contamination of underground waters through possible radioactive material surface seepage. (2) Accessibility to population centers (Augusta and Aiken) to avoid need for new "atomic cities". (3) Vulnerability to enemy attack.

This contract will be handled by a specially set up division of du Pont's Explosives department, with design and field construction under the company's Engineering Department. Don A. Miller, who will be Works Manager, and Robert K. Mason, Field Manager in charge of construction, of the Savannah River plant, will be among first du Pont officials on the scene. Curtis A. Nelson is manager of the USAEC's new office specifically organized for this project, and Robert C. Blair is his deputy; temporary offices are in Wilmington, Dela. Construction engineers of du Pont have now opened temporary offices in the Augusta municipal auditorium; the USAEC will open local offices shortly. Both du Pont engineers and men from the U. S. Corps of Engineers are already at work at the new site. (Inhabitants of 4 small towns within the site's boundaries were told they have 18 months in which to find new places to live.) Construction at the site will start early in 1951; construction force is expected to reach 8,000 during first six months of activity.

Contract for design and engineering of a new uranium ore refinery has now been awarded to Catalytic Construction Co., Philadelphia by the USAEC, through its New York office. The work will be done in two phases. Phase one will be a study of existing research and development work on uranium refining processes, and the submission of a preliminary engineering report. Phase two will be final selection of a process and detailed design and engineering of the refinery which is estimated to have a completion cost of $10 million.

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NUCLEAR REACTOR POLICY CHANGE OF U. S., ENGLAND, & CANADA...

The Governments of the United States, United Kingdom, and Canada have now adopted a revised Declassification Guide which will permit the publication of certain information necessary to the design, construction, and operation of specified low-power nuclear reactors used for research purposes. As a result of this new policy (which it is hoped will speed training of nuclear reactor engineers and technicians), detailed information will be available for the first time on three of the United States' nuclear reactors, and one each in Britain and Canada.

The British and Canadian reactors affected by this revised policy are "Gleep", the uranium and graphite reactor at Harwell, England, and "Zeep", the uranium and heavy water reactor at Chalk River, Ontario, Canada.

Of most general interest is the fact, until now classified, that the low energy thermal neutrons needed for maintaining the chain reaction, are captured in appreciable quantities by Uranium-235 without causing fission. Instead, a new element is formed, uranium-236, which is non-fissionable. Engineers designing uranium reactors must keep this fact in mind, since these captured neutrons are not available to continue the chain reaction.

Other information revealed relates to the average number of neutrons produced in the fission of uranium-235 by thermal neutrons, hitherto quoted as "between 2 and 3", and for the relative probabilities (cross section) of these thermal neutrons producing fission and being captured or scattered by U-235, U-238, or natural uranium.

Of the three United States' reactors on which additional data has been released, the Argonne National Laboratory's uranium-graphite nuclear reactor was the one in which the first self-sustained nuclear chain reaction was achieved December 2, 1942. It was, of course, first erected at Stagg Field, University of Chicago. Argonne's uranium-heavy water reactor was first operated May 15, 1944; it was the world's first heavy water nuclear pile. The third U.S. reactor is the so-called Los Alamos "water boiler", of which there were two models. One of these, of low power, was known as "Lopo", while the other is called "Hypo".

The Argonne uranium-graphite reactor (moved and re-assembled at the Laboratory's Palos Park site) is 30 feet wide, 32-feet long, and 21-feet high. Inside its five-foot concrete walls is the reactor core, a cube shaped pile of graphite into which lumps of uranium have been imbedded according to a predetermined lattice-type pattern. The top is covered with 6 inches of lead, and about 4 feet of solid wood. The reactor contains about 3,200 uranium metal lumps weighing about 10 tons; it is surrounded with uranium oxide lumps (due to scarcity of uranium when it was built). There are about 472 tons of graphite in the reactor.

Argonne's heavy water reactor is small compared to the graphite moderated reactors. It consists of an aluminum tank, 6-feet in diameter, and 8-feet ten-inches high, filled with approximately six and one-half tons of heavy water (amount contained in 32,000 tons of ordinary water) and in which are suspended 120 uranium metal rods, 1.1 inches in diameter and 6 feet long. The heavy water serves both as moderator and cooling agent (it is circulated through a heat exchanger). The reactor tank rests on a two-foot layer of graphite blocks supported by the concrete pile foundation. The graphite reflects the neutrons to the reactor core. In addition to this neutron reflector on the bottom, the sides are provided with a reflector of equal thickness. There is also other shielding of lead-cadmium alloy, lead bricks, and cadmium metal.

The Los Alamos "water boiler", or "Hypo", put into operation Dec. 1944 after the low-power "Lopo" operated successfully, is the smallest and most economical type of chain reactor so far built. Its peak power has been about 6 KW. The heart of the reactor is a one-foot spherical stainless-steel container filled with uranyl nitrate solution in water. Surrounding the container is a reflector consisting of an inner core of beryllium oxide, supplemented by a shell of graphite. The reactor and reflector occupy a cube about five feet on a side. Shielding is with 4 inches of lead, 1/32nd inch cadmium, and five feet of poured concrete.

AT THE ATOMIC CITIES & CENTERS IN THE UNITED STATES...

ARCO, Idaho- The high neutron flux materials testing reactor, (MTR), at the nuclear reactor testing station here, will be operated by Phillips Petroleum Co., of Bartlesville, Okla., under a contract recently negotiated with that firm by the USAEC, through its Idaho Falls, Idaho, office. Thirty-four firms were considered for the job before Phillips was selected, a spokesman for the USAEC said. Buildings and other facilities for the MTR plant are now being erected here by the Fluor Corp., Los Angeles, and other contractors; engineering design of the structures was done by Blaw-Knox Construction Div., Pittsburgh, Pa. The reactor itself, designed by the staffs of Argonne and Oak Ridge Laboratories, is now being built at Oak Ridge. Total cost of the MTR is placed at $18 million.

Primary purpose of the MTR will be to pre-test nuclear reactor materials, and component assemblies, under the neutron flux, temperature and other conditions comparable to those to which they will be exposed. As presently planned, the MTR can provide fluxes of both thermal neutrons and fission neutrons comparable to those met in any reactor likely to be built in the near future. Heavy water will be used as coolant material in the MTR, to increase its neutron-producing ability. The heavy water will be supplied by the U. S.'s new $5 million heavy water production plant at Wabash River Ordnance Works, Vermillion, Ohio, where heavy water will be produced by the low temperature distillation of extremely large volumes of hydrogen.

RICHLAND, Washington- Marking another step in the major laboratory expansion here at Hanford Plutonium Works, bids were recently received for an important unit in this expansion--the health instrument control and development laboratory. Low bid of $1,154,203.00 was made by Sound Construction Co., Seattle, among a group of 14 bids submitted. This laboratory, as well as facilities in the fields of radiochemistry, radiophysics, radiometallurgy, and a pile technology unit, will be important units in the $15 million technical center here, for which $5½ million has been allocated in the USAEC's current fiscal year budget. (All work here is handled through General Electric Co., Hanford contract operators of the plutonium plant, and the associated town of Richland.) First work on the technical center, which is a consolidation of existing programs, and future projects, began in 1949, when work was initiated on the radiobiology laboratory, and the experimental animal farm.

NEW BOOKS & OTHER PUBLICATIONS...in the nuclear energy field...

Sourcebook on Atomic Energy, by Samuel Glasstone. This work, by Dr. Glasstone, who is the editor of "Effects of Atomic Weapons", and author of some 15 books in basic physical science, covers such subjects as measurement of radioactivity, nuclear radiations, acceleration of charged particles, nuclear fission, utilization of nuclear energy and use of isotopes. Prepared and written under direction of USAEC.--D. Van Nostrand Co., Inc., New York 3, N. Y. ($2.90)

Industrial and Safety Problems of Nuclear Technology. The semi-technical papers and discussions of the conference of that name held in New York, January, 1950, which was sponsored by New York University. The 18 papers of the conference covered industrial development, apparatus, research, radiation medicine, casualty insurance, business contracts, and other subjects in the field of nuclear work. M. H. Shamos and S. C. Roth, editors. 368 pages. Harper & Bros., New York 16. ($4.00)

Some Applications of Nuclear Physics to Medicine. Editor: W. V. Mayneord, Prof. of Physics applied to Medicine, University of London. Issued as "Supplement No. 2" to the British Journal of Radiology, Nov., 1950; available at 35s. (An older volume, "Certain Aspects of the Action of Radiation on Living Cells", is priced at 16s.) -- British Institute of Radiology, 32 Welbeck St., London, W.1.(Eng.)

Papers on Radiography. The papers and discussions of a session on radiography at the 52nd annual meeting of the Amer. Soc. for Testing Materials. Includes recent progress in flash radiography, 10 Mev x-ray technique, mobilizing the Van de Graaff generator for precision radiography, etc. 100 pages, illus.--ASTM,1916 Race St., Philadelphia 3, Pa. ($1.75)

Fire Protection in Uranium Handling Procedures, by E. J. Kehoe, M. Eisenbud, and F. L. Brannigan. Safe methods of handling uranium turnings, chips, borings, and sawdust. --M. J. Kehoe, Chief, Fire & Accident Branch, USAEC, P. O. Box 30, Ansonia Sta., New York 23 (n/c)

NEW PRODUCTS, PROCESSES & INSTRUMENTS...for nuclear work...

FROM THE MANUFACTURERS- Scintillation Counter, Type 155, consists of individual channel amplifiers, a coincidence circuit, a ratemeter or scaling circuit, and power supplies for photo-multiplier and vacuum tubes. The counter is used with a scintillation detector head containing a matched pair of type 1P21, or type 5819, photomultiplier tubes. This detector head also contains the scintillating phosphor and voltage divider ladders. Ability to localize small sources of radiation, its wide range of sensitivity, and its low and stable background count are said by the manufacturer to be some of the feature of this Type 155 Counter.--W. S. MacDonald Co., Cambridge 38, Mass.

Stilbene, the synthetically grown hydrocarbon crystal, as well as the company's own solid plastic phosphor, for use in scintillation detector units. Manufacturer states that while phosphors of up to one inch in any dimension meet most requirements for luminescent materials, for high efficiency gamma counting, for cosmic ray research, and for fast neutron counting, considerably larger phosphors are required. Since the cost of crystalline phosphors (such as Stilbene) of the necessary size would be prohibitive, the company's own inexpensive luminescent plastic has been made available. Tracerlab, Inc., Boston 10, Mass.

The "Atomobile", a large enclosed truck (with its own power supply) equipped with radioactivity detecting equipment, is available to municipalities in preparation for atomic bomb emergencies. The truck's equipment includes air and water radioactivity monitoring devices, portable radiation survey meters, radiochemical equipment for assay work, together with protective clothing, lead lined gloves, gas masks, fire extinguishing equipment, etc. A two-way radio is also part of the truck's equipment. --Radiation Counter Laboratories, Inc., Chicago 8, Ill.

PRODUCT DEVELOPMENT - Hafnium metal, of high purity, has been made in pound quantities at the Y-12 laboratories of the Oak Ridge National Laboratory Oak Ridge. Typical analysis shows a hafnium-zirconium ratio of 98 to 2, with total additional impurities of less than 0.2%. Raw material is hafnium oxide extracted from crude zirconia by the Y-12 chemical division.

A self-developing photographic dosimeter, which may be worn on a cord around an individual's neck to measure exposure to ionizing radiation and which gives a reading inside of a minute, has been developed by Polaroid Corp., Cambridge, Mass., under a U. S. Army contract. Specifications were written by Signal Corps Engineering Laboratories, Fort Monmouth, N. J. The dosimeter consists of a small metal case containing a flat paper package. The package, or plaque, in turn, contains photographically sensitized film and a pod of developing solution. Following exposure to radiation, the wearer pulls the film plaque through a slot in the case, breaking the pod, and spreading the developer and other chemicals over the film. After an interval of one minute, the user tears open the plaque. The film has graduated scales on its outer edges, and an unexposed center postion. Since exposure to gamma radiation received causes the center strip to turn light in proportion to the gamma dosage, comparing it with the grade scale on the edge of the film gives a good measure of the degree of exposure. (The case is shielded against alpha and beta particles.)

NEWS AND NOTES-As a result of costly damage to photographic supplies from radioactive contamination, particularly in packaging materials, E. I. du Pont de Nemours & Co. have now asked their suppliers for help in detecting any possible sources of such contamination. Du Pont have listed in a letter to their suppliers such sources of contamination as radioactive tracer materials; scrap metals and machinery from atomic activities; and dirt and dust from uranium refining operations.

The British firm of Mullard Electronic Products, Ltd., London, has now made available two sub-miniature tubes for nuclear radiation instruments. The type ME-1401 is a 1.25-volt triode, while the type ME-1402 is a 0.25-volt tetrode.

RAW MATERIALS...radioactive ores & other materials for nuclear work...

UNITED STATES- Flotation of its stock issue in the U. S., by American -Canadian Uranium Co., Ltd., was questioned last week by New York Attorney-General Nathaniel L. Goldstein, acting under the Martin Act (New York State's "blue sky" law). (President of American-Canadian is Paul V. McNutt, former Ambassador to the Philippines; vice-president is Josiah Marvel, Jr., former Ambassador to Denmark. American-Canadian claims and concessions were acquired from Pax Athabaska, and the Marmac Syndicate, Canadian mining companies. McNutt, Marvel, and one M. E. Young, Toronto, make up Marmac.)

The Attorney-General, in objecting to the manner in which American-Canadian is offering its stock, pointed out that the vendor shares of the officers were 2,400,000 shares of capital stock, acquired for $90,098.00 The public offering is 500,000 shares at $3.50 each. This gives the vendors 83% of the stock, with the public offering amounting to only 17%. The Attorney-General also objected to the underwriter, the First International Securities Corp., a firm newly formed, solely to place the issue, with its principal stockholder an officer and/or director of the companies with an interest in American-Canadian. Commission was to be $250,000.00, he observed; this was with an investment of $10,000.00. Last week, the Attorney-General had asked 105 security dealers to advise him on stock sales they made of American-Canadian.

Informed Canadian mining men point out that the vendor shares are indeed excessive; further, M. E. Young, of Toronto, the associate of McNutt and Marvel, has a record of jail sentence in Canada for fraud and conspiracy in connection with stock manipulation.

CANADA- Reports of Ranwick Uranium Mines, Ltd., are that a grade of ore of between 0.1% and 0.2% can be expected; development is now underway, with actual production still in the offing. At Ranwick, which is in the Montreal river area, 80 miles north of Sault Ste. Marie, visible pitchblende is said to have been observed in the zone under the main surface showing. Mining engineer J. D. Ludgate, in reporting on the operation, notes that when visible pitchblende is encountered, ore grade material is invariably indicated.

ENGLAND- In order to relieve Tanganyika Concessions, Ltd., of the "crushing burden of taxation", the principal seat of management and control has been transferred from London to Salisbury, Southern Rhodesia (Africa), the Chairman, M. Hely-Hutchinson said at the company's recent annual meeting in London. He noted that in 1944 the firm's assets were £20 million. (Tanganyika Concessions, which owns a 14% interest in the Belgian firm Union Miniere du Haut-Katanga, operators of such mining properties as the Shinkolobwe pitchblende pits--world's top ranking uranium producer--recently allowed American interests to acquire 600,000 shares of the firms ordinary (common) stock.

IONIZING RADIATION...investigations & notes...

Capillary fragility, and protection against radiation sickness, has been investigated by B. Sokoloff, J. B. Redd, and R. Dutcher, of the Southern Bio-Research Laboratory, Florida Southern College, Lakeland, Fla. They found that capillary fragility was induced not only by ionizing radiation, but by administration of leukotoxine, and by a bacterial polysaccharide. Prevention of such injury, caused by one or the other of these, may be brought about by administration of a compound composed of flavonoids naturally present in citrus fruits. Four factors present in this compound, isolated from citrus fruits, were identified as chalcone hesperidin, glucose-hesperidin, eriodictin, and a quercitrin-like substance.

Sincerely,

The Staff,
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